

NUTRIENTS ANNEX

OVERVIEW

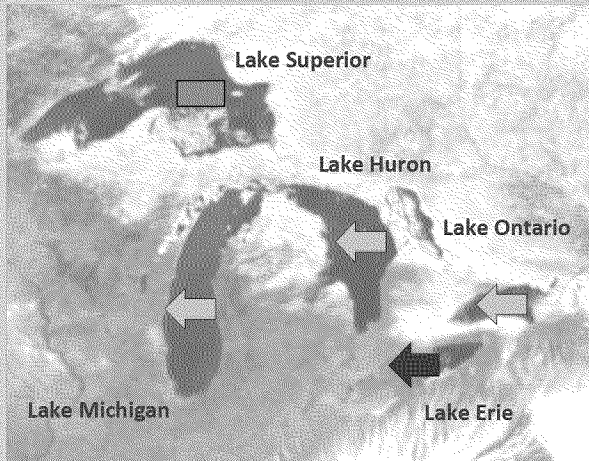
In Lake Erie in particular and some other areas of the Great Lakes (as seen in Figure 7), excess phosphorus loadings threaten water quality and ecosystem health by contributing to harmful and nuisance algal blooms that can cause drinking water impairments, exacerbate low oxygen conditions, and drive beach closures that result in loss of recreational opportunities. Recognizing the magnitude of the threat to Lake Erie, the 2012 Agreement requires Canada and the United States to establish phosphorus load reduction targets allocated by country for the nearshore and open waters of Lake Erie, by 2016, and to develop Domestic Action Plans to achieve the Lake Erie targets by 2018.

On February 22, 2016, following a robust binational science-based process and an extensive public consultation, the United States and Canada adopted new phosphorus reduction targets for major tributaries and priority watersheds in the Lake Erie basin. The Parties and multiple partner agencies are now working to develop Domestic Action Plans to meet the 2018 deadline.

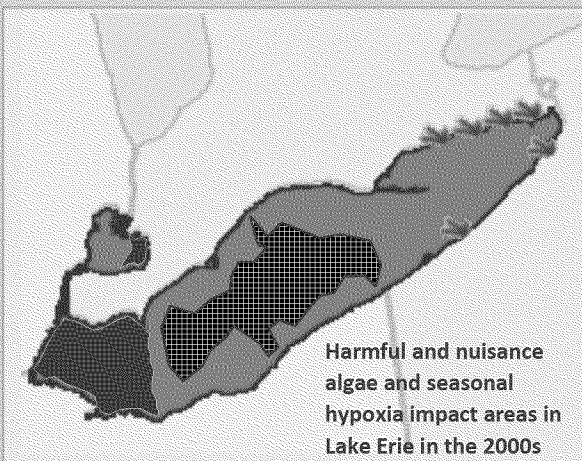
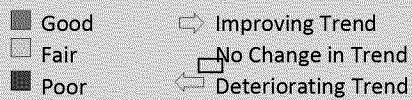
Figure 7 – Excess phosphorus loadings threaten Great Lakes water quality and ecosystem health.

Lake Erie

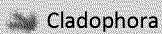
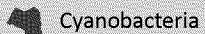
Most Impacted & Our Highest Priority



State of the Great Lakes, 2016 Draft Assessment of the Nutrients in Lakes Sub-indicator



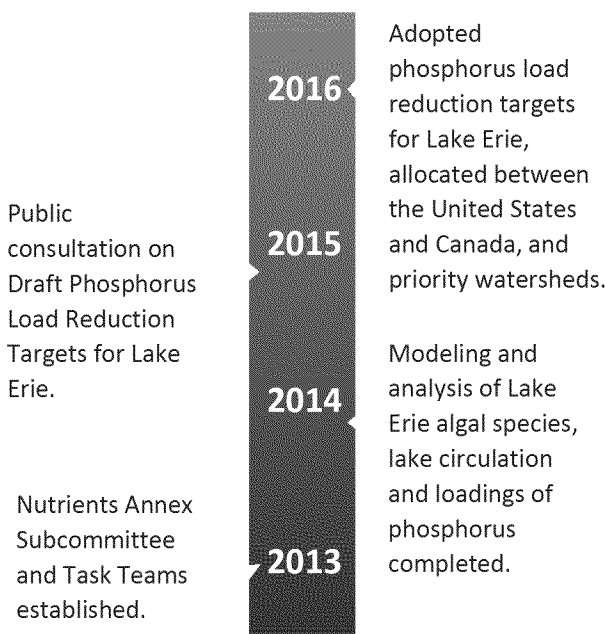
Harmful and nuisance algae:



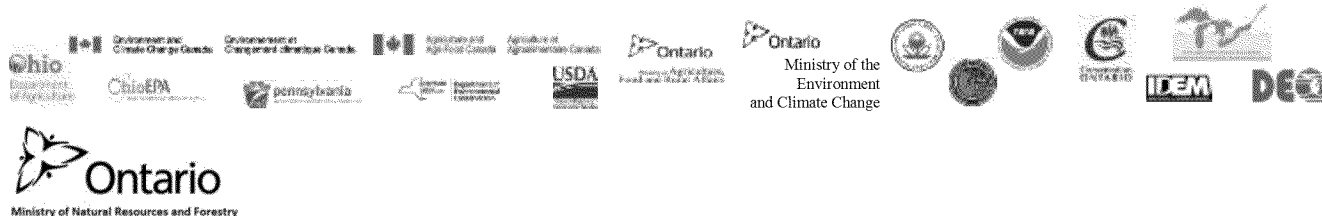
Seasonal hypoxia:



Low oxygen conditions exacerbated by excess nutrients



This Annex's implementation is supported by the Nutrients Annex Subcommittee, co-led by the United States Environmental Protection Agency and Environment and Climate Change Canada. Organizations on the subcommittee include:



BINATIONAL ACTIONS TAKEN

By 2016, develop binational substance objectives for phosphorus concentrations, loading targets, and loading allocations for Lake Erie.

- The Parties led an extensive binational effort to increase understanding of the Lake Erie algae problem in relation to the three main basins of the Lake – the Western Basin, the Central Basin and the Eastern Basin. Information on algal patterns and species, lake circulation, and sources and loadings of phosphorus were studied. Modeling experts from Canada and the United States used nine different computer simulation models to correlate changes in phosphorus levels with levels of algal growth. By comparing and contrasting the results of these models, draft phosphorus load reduction targets to achieve the Lake Ecosystem Objectives for Lake Erie were developed.
- The Parties then led extensive consultations of the draft targets. Information about the draft targets was made available online, for approximately 60 days up to August 31, 2015, through www.binational.net, and Environment and Climate Change Canada and United States Environmental Protection Agency websites. The Parties also reached out through a number of binational and

domestic face-to-face meetings with interested stakeholders and partners including agricultural commodity groups, municipalities, Conservation Authorities, First Nations, non-government organizations, and others. Feedback received included both technical comments on the targets as well as ideas for action.

- Following this robust science-based process and public consultation, Canada and the United States adopted the following phosphorus reduction targets for Lake Erie (based on a 2008 baseline year):
 - **To minimize the extent of hypoxic zones in the waters of the central basin of Lake Erie:** a 40 percent reduction in total phosphorus entering the western and central basins of Lake Erie—from the United States and from Canada—to achieve an annual load of 6,000 metric tons to the central basin. This amounts to a reduction from the United States and Canada of 3,316 metric tons and 212 metric tons, respectively.
 - **To maintain algal species consistent with healthy aquatic ecosystems in the nearshore waters of the western and central basins of Lake Erie:** a 40 percent reduction in spring total and soluble reactive phosphorus loads from the following watersheds where algae is a localized problem: in Canada, Thames River and Leamington tributaries; and in the United States, Maumee River, River Raisin, Portage River, Toussaint Creek, Sandusky River and Huron River (Ohio).
 - **To maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the waters of the western basin of Lake Erie:** a 40 percent reduction in spring total and soluble reactive phosphorus loads from the Maumee River in the United States.
- Further science and analysis is underway to establish targets that will minimize impacts from nuisance algae in the eastern basin of Lake Erie.

By 2018, develop binational phosphorus reduction strategies and domestic action plans to meet the objectives for phosphorus concentrations and loading targets in Lake Erie.

- The United States and Canada are working with multiple partner agencies, tribes, First Nations, Métis, and stakeholders to develop a binational phosphorous reduction strategy and Domestic Action Plans. These plans will identify the actions required to meet the agreed to load reduction targets. Stakeholders are being engaged during the development process, and the draft plans will be available for further consultation in 2017.

Assessing, developing, and implementing programs to reduce phosphorus loadings from urban, rural, industrial and agricultural sources.

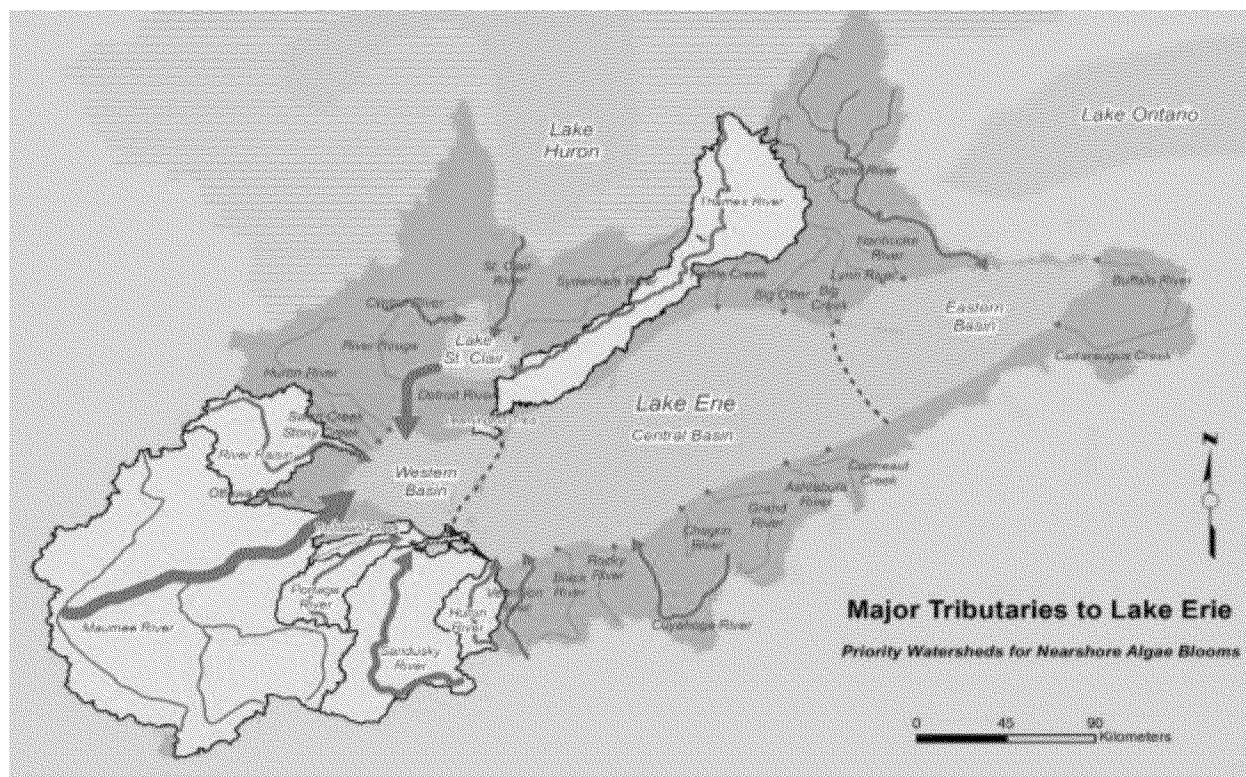
- Ongoing efforts to limit excess phosphorus loading to the Great Lakes – through detergent bans, optimizing sewage treatment, and implementing best management practices on agricultural lands – must continue and be enhanced with better targeting and adoption. Work is underway to evaluate existing programs in Canada and the United States, identify opportunities to maximize current

phosphorus reduction efforts, and propose new programs and approaches to manage phosphorus loadings from municipal and agricultural point and non-point sources.

Identifying priority watersheds that contribute significantly to local algae development, and implementing management plans to achieve phosphorus load reduction targets and controls for these areas.

- While phosphorus reductions are required from all watersheds entering Lake Erie, the United States and Canada identified eight priority watersheds (as seen in Figure 8) – two in Canada and six in the United States – where phosphorus control is required in order to address algal blooms occurring in the nearshore waters of Lake Erie.

Figure 8 – Major tributaries to Lake Erie and the priority watersheds for nearshore blooms. Tributary size indicates magnitude of phosphorus loading to the Lake in 2008.



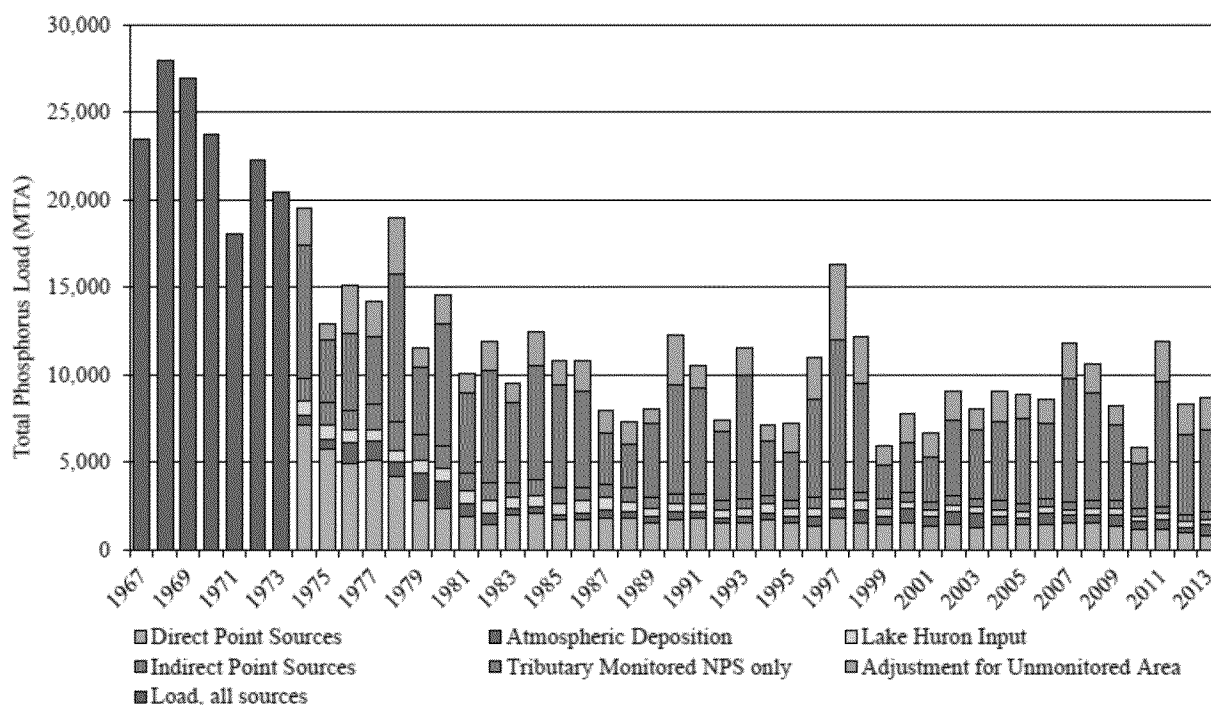
Undertake and share research, monitoring and modeling necessary to establish, report on and assess the management of phosphorus and other nutrients and improve the understanding of relevant issues associated with nutrients and excessive algal blooms.

- Canada and the United States engaged many scientific experts in the development of the new phosphorus loading targets for Lake Erie, and are currently developing an approach to monitor and

track progress towards the new targets. The following priorities for research, monitoring and modeling have been identified:

- Monitoring of total phosphorus and dissolved reactive phosphorus loads and harmful algal blooms and hypoxia extent and duration to evaluate effectiveness of load reduction efforts and the lake's response over time;
 - Research on factors that contribute to toxin production by harmful algal blooms;
 - Better understanding of internal lake phosphorus loads, including factors controlling the growth of the nuisance alga, *Cladophora* and improvement of ecosystem models to assist in understanding the relationship between external and internal phosphorus loads and the occurrence of algal blooms.
- Figure 9 shows phosphorus loadings data collected in support of the previous targets. Canada and the United States tracked phosphorus loads and sources on a whole-lake basis. The new targets for Lake Erie are refined to specific locations, forms of phosphorus, and time of year. Going forward, tracking and assessments related to these new targets will need refinement and appropriate data collection will be critical to the evaluation of implementation efforts and the Lake's response over time.

Figure 9 – Total phosphorus loads to Lake Erie by source type, 1967 - 2013.



DOMESTIC ACTIONS TAKEN



- The United States has several permitting and funding programs to reduce phosphorus loadings from municipal, industrial and agricultural sources. For example, state environmental and agricultural programs establish discharge limits and comprehensive nutrient management plans to manage nutrient pollution. Since 2008, \$314 million in Farm Bill funding has supported conservation activities on 2.5 million acres of private land throughout the Great Lakes region. Since 2010, hundreds of millions of dollars have been allocated for a wide array of projects that will reduce the loading of nutrients to the Great Lakes – nutrients that can fuel harmful algal bloom. For example, more than 680 projects and \$60 million of GLRI funds were invested in the Lake Erie Basin from 2010 through 2015 to reduce phosphorus, nutrient, and nonpoint source pollution and to support related science and monitoring work. A new United States Department of Agriculture Natural Resources Conservation Service initiative launched in 2016 will help landowners reduce phosphorus runoff from farms by more than 640,000 pounds (290 metric tons) each year by effectively doubling the acres under conservation in the Western basin over the course of the three-year investment.
- Through the GLRI, federal agencies and their partners are reducing nutrient loads into the Great Lakes. During fiscal year 2015, federal agencies and their partners funded nutrient and sediment reduction projects on over 100,000 acres of targeted watershed in the Great Lakes Basin. These projects are projected to prevent over 160,000 pounds (72.5 metric tons) of phosphorus from entering the Great Lakes annually. During fiscal year 2015, federal agencies and their partners also funded urban runoff projects that are anticipated to capture an average annual volume of more than 37 million gallons of untreated urban runoff per year. These projects reduce flooding, increase green space in urban areas, and return vacant properties to productive use.
- The United States Geological Survey has installed 22 GLRI-funded edge-of-field monitoring stations on farms in the Maumee River basin, the Fox River basin, the Saginaw River basin and the Genesee River basin. These stations will gather weather data and sample runoff water during storm events. The water samples will be analyzed for their phosphorus, nitrogen, and sediment content. The United States Department of Agriculture-Natural Resources Conservation Service staff will assist the cooperating farmers with installing conservation practices in the field above the stations. This analysis will help quantify the value of conservation practices in reducing sediment and nutrient delivery from these fields, under these conditions, in order to improve water quality.
- The GLRI is also funding the implementation of conservation practices including cover crops, silage leachate containment areas, a waste storage structure, and nutrient management on conservation demonstration farms in the Fox River basin. The farms are open for annual tours where other farmers in the watershed can view the installed practices, hear farmers' opinions on the value that conservation farming practices can add to their farming operations, and ask questions.
- GLRI-funded research led by the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory, in collaboration with partners from the University of Michigan's Cooperative Institute for Limnology and Ecosystems Research, is investigating impact of land use

changes on algal bloom development in the western basin of Lake Erie and in Lake Huron's Saginaw Bay. The Great Lakes Environmental Research Laboratory combines remote sensing, monitoring, and modeling to produce weekly forecasts of *Microcystin* bloom concentration and transport in Lake Erie, which are distributed to regional stakeholders. National Oceanic and Atmospheric Administration researchers, with their partners at Heidelberg University, have also initiated early season projections of the seasonal harmful algal bloom severity in western Lake Erie.

- During fiscal year 2015, GLRI partners established a network of four real-time continuous observing buoys to track detailed water quality conditions to support modeling, forecasting, and public warnings of harmful algal bloom conditions throughout western Lake Erie. The observing buoys are capable of tracking water quality and bloom conditions and measuring dissolved phosphorus concentrations at hourly intervals. During the 2015 bloom season, these buoys collected over 7,000 in-lake nutrient and water quality measurements, providing unprecedented spatial and temporal details of internal lake dynamics and bloom development. In addition to providing real-time tracking of harmful algal bloom conditions for water intake managers and recreational users, the observing data will be used to improve ongoing forecasting efforts covering a range of spatial and temporal scales including seasonal harmful algal bloom forecasts, 5-day forecasts, and vertical distribution forecasts.
- In June 2015 Governor Rick Snyder of Michigan, Premier Kathleen Wynne of Ontario and Lieutenant Governor Mary Taylor of Ohio signed the Western Basin of Lake Erie Collaborative Agreement which establishes a collaborative initiative that will use adaptive management to achieve a recommended 40 percent total load reduction in the amount of total and dissolved reactive phosphorus entering the WLEB by the year 2025 with an aspirational interim goal of a 20 percent reduction by 2020. Each state and province commits to developing, with stakeholder involvement, a plan outlining their proposed actions and time lines toward achieving the phosphorus reduction goal.
- Michigan has finalized its 2016 Implementation Plan, which is the first step in achieving a 40% phosphorus reduction by 2025, for the Western Lake Erie Basin Collaborative (<http://glc.org/projects/water-quality/lent/>). The 2016 Implementation Plan can be found at Michigan's Department of Environmental Quality's Water Resources Division (http://www.michigan.gov/documents/deq/wrd-western-lake-erie_503547_7.pdf).
- Also in support of the Western Lake Erie Basin Collaborative, Ohio has released its draft Western Lake Erie Basin Collaborative Implementation Plan to reduce phosphorus entering Lake Erie by 40 percent by 2025. The plan was developed with input from various stakeholder groups and state agencies and is available at epa.ohio.gov/Portals/33/documents/WLEBCollaborative.pdf. Public comments are requested by June 25, 2016.
- Indiana is working with landowners in the communities to help improve the water quality of streams and inland rivers, and ultimately Lake Erie. A summary of the Indiana Western Lake Erie Basin Initiatives can be found at the Indiana State Department of Agriculture (<http://www.in.gov/isda/3261.htm>).
- The Pennsylvania Vested in Environmental Sustainability (PA VinES) Program assists grape farmers in the Lake Erie Basin to improve environmental and economic sustainability of their agricultural operations. Pennsylvania DEP, with partners Penn State University, Cornell University, NRCS, Erie

County Conservation District and the Pennsylvania Farm Bureau, developed a Grower Self-Assessment Workbook that helps identify on-farm opportunities to reduce non-point source pollution to Lake Erie tributaries and increase farm profitability. Pennsylvania DEP recently awarded Erie County Conservation District over \$360,000 in state grant funding to begin implementation of prioritized agricultural best management practices that are identified through the Grower Self-Assessments.

- In coordination with the Pennsylvania Lake Erie Harmful Algae Bloom (HAB) Task Force, Pennsylvania Department of Environmental Protection began a strategic partnership with the Regional Science Consortium at Presque Isle to complete comprehensive monitoring of Pennsylvania Lake Erie beaches and public areas for the presence of HAB conditions throughout the 2016 season.
- Pennsylvania Department of Environmental Protection awarded \$150,000 in state grant funds to the non-profit Environment Erie to work with Lake Erie MS4 municipalities to plan for future stormwater infrastructure needs. This project will evaluate current operations and develop a tailored framework for each participating municipality to generate sustainable revenue through stormwater fees or utilities. Pennsylvania just recently authorized the ability of municipalities to form stormwater utilities, and this program looks to increase municipal capacity to improve MS4 operations to reduce urban stormwater-related impairments such as excess nutrients, erosion and sedimentation, and flow variability.
- In June 2014, Congress reauthorized the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA) by passing the Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2014 (HABHRCA 2014, P.L. 113-124). The reauthorization of HABHRCA acknowledged concerns related to HABs and hypoxia, extended the scope of the legislation to include freshwater HABs and hypoxia, and recognized the need for further coordinated action across the Federal sector to address these issues. Additionally, the legislation called for Federal agencies to provide integrated assessments on the causes and consequences of and approaches to reducing HABs and hypoxia nationally, with particular emphasis on the Great Lakes. Finally, the reauthorization included a specific focus on the needs of stakeholders, requiring that Federal agencies engage with stakeholders around the country.
- On August 7th, 2015, the President signed H.R. 212 (Drinking Water Protection Act) which directs EPA to develop and submit a strategic plan for assessing and managing risks associated with algal toxins in drinking water provided by public water systems. The resulting *Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water*, released in November 2015, includes steps and timelines to assess: algal toxins and their human health effects, health advisories, factors likely to cause HABs, treatment options, analytical methods, frequency of monitoring, treatment options, and source water protection practices.



- Canada and Ontario are taking action under the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health, 2014, to reduce phosphorus loads to Lake Erie through urban, agricultural, rural and industrial or commercial point and non-point source initiatives including ongoing infrastructure and agricultural stewardship programs. To further improve the effectiveness of current and future phosphorus reduction actions in Lake Erie, Canada and Ontario, along with their partners and stakeholders are working to review and where necessary implement changes to the existing program, policy and legislative phosphorus management frameworks.
- Canada's Great Lakes Nutrient Initiative (2012-2016) enhanced Environment and Climate Canada funding to support the critical science and policy development needed to support the establishment of new phosphorus reduction targets for Lake Erie. Initiative activities included:
 - enhanced water quality monitoring at key locations in the Lake Erie basin – including the Thames River, the Sydenham River, the Detroit River and the Grand River – in order to measure phosphorus concentrations and loads from the Canadian portion of the Lake Erie basin;
 - new modeling and research to enhance understanding of the factors contributing to the reoccurrence of large scale outbreaks of toxic and nuisance algae in Lake Erie;
 - an assessment of current Canadian best practices and policy options for reducing loadings of phosphorus to Lake Erie in order to achieve targets;
 - an assessment of socio-economic costs of algal blooms in Lake Erie;
 - the development of inventories of phosphorus management programs;
 - cost-benefit modeling of phosphorus management in the Grand River basin; and,
 - an assessment of future trends and demographics in urban and agriculture landscapes in the Lake Erie basin.
- Canada's 2016 Federal Budget announced \$3.1 million in 2016 to 2017, to Environment and Climate Change Canada, to continue to improve nearshore water and ecosystem health, by reducing phosphorus and the resulting algae in Lake Erie. With these resources, and building on the work accomplished under the Great Lakes Nutrient Initiative, the focus will shift from setting phosphorus targets to achieving them, including developing a domestic action plan in collaboration with Ontario and other partners, and monitoring and reporting on progress.
- Canada's 2016 Federal Budget also announced a five-year, \$5.0 billion investment in water, wastewater and green infrastructure projects across Canada. This includes the \$2 billion Clean Water and Wastewater Fund (CWWF), of which \$569,642,062 has been allocated for water and wastewater projects in the Province of Ontario. The CWWF, and existing programs such as the New Building Canada Fund – Provincial-Territorial Infrastructure Component (NBCF-PTIC), can address phosphorus loads from municipal wastewater, as well as other priorities. Provinces and territories, in consultation with municipalities, are responsible for identifying projects to be funded through the CWWF and the NBCF-PTIC. As such, it is up to the Province of Ontario to prioritize projects for reducing phosphorous loads in the Great Lakes under these programs.
- Canada continues to invest in research that improves our understanding of phosphorus uptake and movement, and develops best management practices and technologies to improve crop nutrient use efficiency and reduce phosphorus losses from agricultural production to the Great Lakes. Over the last three years, projects funded by Agriculture and Agri-Food Canada have investigated the nature of losses of phosphorus through subsurface tile drains, improved field and regional indicators of risk of phosphorus loss to water, developed tests to indicate availability of phosphorus from different

manures and soils to crops and losses by water, and characterized the Canadian Basin of Lake Erie by agricultural production systems (i.e. cropping, livestock, horticulture). Research on Lake Erie is also a priority under the science sector strategy for *Agro-ecosystem Productivity and Health*, which is one of the sector strategies guiding future Agriculture and Agri-Food Canada investment in research.

- Canada has also launched discussions with provinces, towards renewing Canada's federal-provincial agricultural policy framework, called Growing Forward. Discussions on priorities for a renewed Growing Forward agreement will take into consideration agricultural contributions to phosphorus loadings.
- As part of the Growing Forward agreement, the governments of Ontario and Canada launched the Great Lakes Agricultural Stewardship Initiative (<http://www.ontariosoilcrop.org/oscia-programs/glsi/>), to provide \$4 million annually, over 2015 to 2018, in targeted support for farmers in the Lake Erie and Lake St. Clair watersheds, and in Lake Huron's southeast shores watershed. Producers and their advisors will identify ways producers can improve soil health, reduce run-off, modify equipment to address risks related to manure application, create soil erosion control structures, grow cover crops, manage crop residue, and build buffer and shelter strips. As part of this initiative:
 - Sub-watersheds requiring focus and attention have been selected where a systems approach to best management practices will be demonstrated, verified, measured and modelled to determine their reduction of non-point phosphorous loading.
 - Education and outreach projects are underway to promote greater understanding of Great Lakes water quality and to promote the uptake of actions to improve it.
 - The Farmland Health Checkup, a proactive whole farm environmental evaluation was created. The Farmland Health Checkup identifies site specific actions to manage phosphorus and soil health by teaming farmers with trained agronomic and water quality experts. Cost-share funding is available for implementing identified actions that reduce phosphorus loss and improve soil health.
- Agriculture and Agri-Food Canada and the Ontario Ministry of Agriculture, Food and Rural Affairs funded the Water Resource Adaptation and Management Initiative (WRAMI) and the Water Adaption Management and Quality Initiative (WAMQI) for \$3 Million. The WRAMI initiative in 2013 (17 projects) and the expanded WAMQI in 2014 (28 projects) included projects to help Ontario farmers better manage nutrients and minimize off-site impacts of nutrients on surface and ground water quality. Demonstration of technologies such as closed system water recycling, precision manure application, low erosion and cover crop planting were all part of this initiative.
- Ontario's Great Lakes Protection Act, 2015, which received Royal Assent on November 3, 2015, reflects the goals and principles of Ontario's Great Lakes Strategy and enshrines it in law, setting out detailed requirements for strategy contents, reporting and periodic review (<https://www.ontario.ca/page/protecting-great-lakes>). The Act is designed to help address the significant environmental challenges facing the Great Lakes and St. Lawrence River Basin, including the changing climate. One of the initial priorities identified under the Act for immediate action is reducing harmful algal blooms by committing to establishing at least one target within two years to support the reduction of algal blooms; and act will enable geographically-focused initiatives as a tool for developing and implementing policies to address priority issues, including reducing excessive algae, in a specific location.

- Ontario government researchers are adding to the understanding of harmful algal blooms and nuisance algae by monitoring nearshore water quality at 17 drinking water intake sites in the Great Lakes, including five locations in Lake Erie. The Government of Ontario also monitors 70 sites in nearshore areas of the Great Lakes to track long-term trends in Great Lakes water quality. These long-term data sets, together with special studies in the lakes and their tributaries, advance our understanding of nearshore responses to climate change and other stressors, including changes in nutrient loading.
- In 2013, the Government of Ontario launched the Multi-Watershed Nutrient Study. The seven-year study will examine the management of agricultural land and the extent of nutrient runoff in 11 agricultural watersheds in the basins of Lakes Erie, Ontario and Huron. This will be an ongoing study to determine the role agriculture can play in resolving a very complex issue. Comparative data from previous studies will be used to track changing climate conditions, to develop a “then-and-now” analysis and to model future scenarios.
- The Ministry of Environment and Climate Change together with the Ministry of Agriculture, Food and Rural Affairs ensure the requirements of the Nutrient Management Act and regulations are met by farmers through approval of nutrient management plans and strategies that detail the source, rate, time and placement of nutrients for crop growth. Ontario continues to provide training, examination and certification of professional nutrient management planners which work with farmers to apply environmentally responsible nutrient use. Resources detailing better management practices and regulatory requirements have been updated to be more interactive and easier to use.
- In 2016, the Government of Ontario increased targeted engagement with the agricultural community to encourage organizations and industry to take the lead in addressing the phosphorus issue. A working group, composed of farmers, conservation authorities, agri-business and farm organizations, was convened to discuss and analyze key priorities to identify and implement additional actions to improve water quality. Topics included timing of application of nutrients and expanded use of cover crops. Workgroup members have initiated pilot projects to support further uptake of actions by farmers such as: in-field demonstrations; education workshops; best management practices toolkits; performance standards coaches for nutrient management; and research to support continuous improvement.
- The Government of Ontario worked with the Ontario Greenhouse Alliance on an overall strategy to reduce phosphorous discharges into the Leamington tributaries – a priority watershed under the 2012 GLWQA due to the presence of nearshore algae blooms. In January 2015, as part of this strategy the Government of Ontario instituted new regulations, under the Nutrient Management Act, to provide an effective option whereby nutrients that can no longer be used in the greenhouse, may be applied to field crops. In the spring of 2016, growers were offered additional information and cost-share support to help them achieve compliance approval for surface water discharges by March 31, 2017.
- 4Rs Nutrient Stewardship is an internationally recognized approach based on core scientific principles of applying the right source of plant nutrition, at the right rate, at the right time, and in the right place to improve nutrient use efficiency to reduce any potential nutrient loss into the environment. As a result of the partnership of the Ontario Ministry of Agriculture, Food and Rural Affairs, Fertilizer Canada, and the Ontario Agri Business Association, Ontario is piloting 4R initiatives

ahead of broader implementation across the Lake Erie basin and has successfully:

- Implemented 20 4R Demonstration Farms;
 - Reached more than 115 Ontario growers through 4R Nutrient Stewardship Workshops;
 - Enrolled 21 agri-retailers in the Ontario Agri Business Association's voluntary 4R Designated Acres pilot program; and
 - Launched the Ontario Certified Crop Advisor 4R Nutrient Management Specialty Certification; 65 of Ontario's Certified Crop Advisors are registered to write the certification exam in August 2016.
- Between 2013 and 2016, Ontario Ministry of Agriculture, Food and Rural Affairs' research programs, University of Guelph Partnership and New Directions, provided approximately \$3.4 million in direct project operating funding to 25 research projects that targeted improvement of agri-food sector's water quality and nutrient management efficiency in the Great Lakes watershed. Another \$1 million since 2013 in 21 applied field projects verified and demonstrated best management practices to support the reduction of phosphorus to Lake Erie. The objectives of these research projects include development and evaluation of wastewater treatment technologies/best management practices, improvement of nitrogen use efficiency in crops, understanding phosphorus dynamics and non-point sources in the field, groundwater quality and soil health. The major research collaborators/partners include primary producers, food processors, Ontario universities and colleges, conservation authorities and non-governmental organizations.